



## Original Article

# Immediate neurological outcome of term babies with perinatal asphyxia in a tertiary level Care Centre in Kerala

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## Abstract

**Background:** *Perinatal asphyxia is a major cause of neonatal mortality and neurological disability. The five minute APGAR score is a good predictor of immediate and long term neonatal outcome.*

**Objectives:** *the study was undertaken to assess the immediate neurological outcome of term babies with perinatal asphyxia and to compare it with APGAR score at 5 minutes to find out any significant difference between severe and moderate birth asphyxia*

**Material and Methods:** *100 terms in born babies with APGAR score  $\leq 6$  were included in the study. Babies with APGAR score  $\leq 6$  were admitted in neonatal intensive care unit and serially assessed during first 72 hours after birth for HIE and convulsion. HIE was further classified by levne grading.*

**Results and Conclusion:** *Hypoxic ischemic encephalopathy (HIE), seizures and mortality were directly proportional to severity of perinatal asphyxia. There is statistically significant difference in the occurrence of HIE, convulsion and mortality between moderate and severe birth asphyxia.*

**Keywords:** *Perinatal asphyxia, 5 minute APGAR scores, Hypoxic ischemic encephalopathy, seizures.*

## Introduction

Reduction of Infant mortality is an important millennium development goal. Perinatal asphyxia is an important cause of neonatal mortality and a significant contributor to infant mortality and morbidity. Perinatal asphyxia refers to a condition during the first and second stages of labour, in which impaired gas exchange leads to fetal hypoxemia and hypercarbia<sup>1</sup>. Following perinatal asphyxia, infants are likely to develop evidences of Hypoxic Ischemic Encephalopathy

(HIE). Hypoxia can cause damage to almost every tissue & organ of the baby<sup>2</sup>. Infants with severe HIE have increased risk of neurological sequelae. The overall mortality rate is approximately 20%. The frequency of neuro developmental sequelae in surviving newborns is approximately 30%. APGAR scoring system is being conventionally used for assessing the cardiorespiratory status of a newborn baby, at birth<sup>3</sup>. In this study, term newborn babies with APGAR Score  $\leq 6$  at 5 minutes were followed up and their immediate

neurological outcome in terms HIE, convulsions and mortality were assessed and analyzed.

### Material and Methods

This prospective study was conducted in the department of Pediatrics, Institute of Maternal and child health, Kozhikode. 100 term inborn babies with Apgar score of 6 and less at 5 minutes were included in the study. As per the study definition, an APGAR score  $\leq 6$  at 5 minutes was considered as perinatal asphyxia, which was further divided into moderate asphyxia, when the APGAR score was between 4 to 6 at 5 minutes and severe asphyxia, when the APGAR score was below 4 at 5 minutes. Only term babies born in IMCH were enrolled in this study, out born babies and preterm babies were excluded. APGAR score was assessed at the labour room at 5 minutes after birth. All term babies with APGAR score  $\leq 6$  were admitted in neonatal intensive care unit and serially assessed during first 72 hours after birth. The babies were examined for evidence of Hypoxic ischemic encephalopathy (HIE) and were classified according to LEVENE GRADING of Hypoxic Ischemic Encephalopathy.

### Observations and Results

In the study group, 68% are males and 32 % are females. When birth weight was considered 83% are appropriate for gestational age (AGA), 15% were small for gestational age (SGA) and 2% were large for gestational age LGA (table- 1). 65 % are born through normal delivery, 31 % by lower segment caesarean section (LSCS) and 4% through instrumental delivery (Table 3). Out of 100 babies, 21 babies (21%) had APGAR of  $< 4$  at 5 minutes (severe asphyxia) and 79 babies (79%) had APGAR in between 4 to 6 at 5 minutes (moderate asphyxia). Regarding mode of resuscitation 39 % of babies required Bag and Mask ventilation (BMV) alone, 56 % required

Endotracheal Intubation and Intermittent Positive Pressure Ventilation (ET + IPPV), in addition to bag and mask ventilation and 5 % required chest compressions and Mechanical Ventilation (Table 4). In the study group, 16 babies (16%) had HIE, out of which, 5 babies (5%) had severe HIE, 10 babies (10%) had moderate HIE and one baby (1%) had mild HIE (Table 5). Among the 21 babies with severe perinatal asphyxia (5 minute APGAR score  $< 4$ ), 10 babies (48%) had developed HIE, whereas out of 79 babies with moderate asphyxia (5 minute APGAR 4-6), only 6 babies (7.6%) had developed HIE (Table -5). The difference is statistically significant (p value  $< 0.001$ ). Regarding severity of HIE, among the 21 babies with APGAR  $< 4$  at 5 minutes (severe asphyxia), 4 babies (19%) had developed severe HIE and 6 babies (28.6%) had developed moderate HIE. Among the 79 babies with APGAR score in between 4 to 6 at 5 minutes (moderate asphyxia), 4 babies (5.1%) had moderate HIE, while one baby each (1.3%) had mild HIE (Table 5). There is statistically significant difference between the two groups (p value  $< 0.001$ ). 15 babies (15%) had seizures, within the first 72 hours of life. Among the 21 babies with severe asphyxia, 10 babies (48%) had seizures while only 5 babies (6.3%) among the 79 babies with moderate asphyxia had seizures (Table 6). There is statistically significant difference between the two groups (p value  $< 0.001$ ). Out of 100 babies in the asphyxiated group, five babies (5%) had died in the first week of life and all of them had severe HIE. Among the 21 babies with severe asphyxia, 4 babies (19%) had expired, whereas out of 79 babies with moderate asphyxia, one baby (1.3%) had expired. (Table 6). There is statistically significant difference between the two groups (p value 0.001).

**Table 1:** Distribution of babies according to birth weight

AGA		SGA		LGA		Total	
No	%	No	%	No	%	No	%
83	83	15	15	2	2	100	100

**Table 2:** Mode of delivery of cases and controls

Normal		LSCS		Instrumental		Total	
No	%	No	%	No	%	No	%
65	65	31	31	04	04	100	100

**Table 3:** Distribution of babies according to 5 minute APGAR

APGAR at 5 minutes	No.	%
<4	21	21
4-6	79	79
Total	100	100

**Table 4:** Mode of resuscitation

Mode of resuscitation	No.	%
BMV	39	39
ET + IPPV	56	56
Chest compressions + Mechanical Ventilation	5	5
Total	100	100

**Table 5:** Occurrence and severity of HIE in relation to 5 minutes APGAR

APGAR	Mild HIE		Moderate HIE		Severe HIE		Total HIE	
	No.	%	No.	%	No.	%	No	%
<4	0	0	6	28.6	4	19	10	47.6
4-6	1	1.3	4	5.1	1	1.3	6	7.6
Total	1	1	10	10	5	5	16	16

**Table 6:** Occurrence of seizures and mortality in relation to 5 minute APGAR

APGAR	NO	Seizure		Mortality	
		No	%	No	%
<4	21	10	48	4	19
4-6	79	5	6.3	1	1.3
Total	100	15	15	5	5

## Discussion

Low APGAR and perinatal asphyxia are commonly encountered medical emergency in neonatology. Following perinatal asphyxia, infants are likely to develop evidences of Hypoxic Ischemic Encephalopathy (HIE). Hypoxia can cause damage to almost every tissue & organ of the baby. Prompt resuscitation and proper follow up care is essential to prevent immediate and long term effects and mortality. The present study is an attempt to compare correlate APGAR score at 5 minutes to immediate neurological outcome in term babies a tertiary level care center. In our study, 21 % of babies had APGAR of < 4 at 5 minutes and 79% had APGAR in between 4 to 6 at 5 minutes, which is comparable to the observation made by Shah et al where, out of 50 babies with perinatal asphyxia, 20% had severe perinatal asphyxia and 80% had moderate perinatal

asphyxia<sup>4</sup>. 39% of cases required Bag and Mask ventilation alone, 56% required endotracheal intubation and intermittent positive pressure ventilation, in addition to Bag and mask ventilation and 5% required chest compressions and mechanical ventilation. Out of 100 babies with low APGAR scores, 16 babies (16%) had developed Hypoxic Ischemic Encephalopathy (HIE) Eugenia et al<sup>5</sup>, reported that hypoxic-ischemic-encephalopathy was present in 15 (12.1%) infants out of 121 babies with perinatal asphyxia, which was comparable to the incidence of HIE in our study. Several authors reported HIE in babies with low APGAR scores varying from 24-52%<sup>6,7</sup>. Out of 16 babies with HIE in our study, most of the babies (10 babies) 63% had moderate HIE, 5 babies (31%) had severe HIE, and one baby (6%) had mild HIE. Similar observations were seen in the study by Onama et

al where HIE was present in 27 (24.8%) of the babies with low Apgar scores, and 13 babies (48%) had moderate HIE and one baby (3.7%) had severe HIE<sup>8</sup>. In our study, out of 21 babies with severe asphyxia, 10 babies (48%) developed HIE whereas only 6 babies (7.6%) out of 79 babies with moderate asphyxia developed HIE. This clearly shows HIE is more common in babies with severe asphyxia. The difference is statistically significant ( $p$  value $<0.001$ ). But, Misra et al reported higher incidence of HIE in severe perinatal asphyxia. According to his study all babies with severe asphyxia developed HIE, and 33 % of babies with moderate asphyxia developed HIE<sup>9</sup>. The lower incidence of HIE in our study could be due to the prompt and Effective resuscitations, as evidenced by the number of endotracheal intubations and intermittent positive pressure ventilation in babies with perinatal asphyxia.

In the present study 15 babies (15%) had seizures, the onset of which was within the first 72 hours of life. The high occurrence of seizures in the asphyxiated group is supported by Vannucci et al<sup>10</sup> who had reported incidence of seizures as high as 50-70% in acutely asphyxiated newborn infants. Perlman et al reported seizures in 5(5.2%) of the 96 infants, with perinatal asphyxia<sup>11</sup>. Among the 21 babies with severe asphyxia, 10 babies (48%) had seizures while only 5 babies (6.3%) among the 79 babies with moderate asphyxia had seizures. Seizures were significantly more in the cases with severe asphyxia than babies with moderate asphyxia. There is a statistically significant difference in occurrence of seizures in between the moderate asphyxia and severe asphyxia. ( $p$  value  $<0.001$ ). In the study by Moster 11.6 % of babies with severe perinatal asphyxia had developed seizures while, 4.7% of babies with moderate perinatal asphyxia had developed seizures<sup>12</sup>.

The present study revealed mortality is almost 15 times higher in severely asphyxiated babies when compared to babies with moderate asphyxia. 5 babies (5%) expired during the first week of life.

Among the 21 babies with severe asphyxia, 4 babies (19%) had expired, whereas out of 79 babies with moderate asphyxia, one baby (1.3%) had expired. When severity of HIE is compared with mortality all of them had severe HIE which emphasizes that severe HIE is a significant contributor to early neonatal mortality. Varying incidences of mortality were reported by various authors. Lam and Yeung reported the mortality was 10%<sup>13</sup> and Onama et al reported the mortality was 12.1%<sup>8</sup>. In the study by Misra et al, 64 babies had perinatal asphyxia, of which 24 babies (37.5%) expired<sup>9</sup>. The differences in the mortality in various studies may be accounted by the different study settings and would be influenced by the obstetric services, neonatal resuscitation team and post resuscitation intensive care available in the institutions.

In our study, mortality was more in babies with severe asphyxia. 80% of the babies who expired had APGAR  $<4$  at 5 minutes while 20% had APGAR of 4-6 at 5 minutes ( $p$  value $<0.001$ ). It was supported by Lie et al, who found that among births with a very low APGAR score at five minutes ( $<4$ ), the neonatal and post-neonatal mortality rates remained high when compared to births with a high APGAR score ( $\geq 7$ ) at 5 minutes<sup>14</sup>. Similar observations were made by Misra et al, in his study, out of the 24 deaths in 64 babies with perinatal asphyxia, 79 % had APGAR  $<4$  and 21 % had APGAR 4-6 at 5 minutes<sup>9</sup>. Casey et al, showed that an APGAR score at 5min  $< 3$  increased the risk of neonatal death by eight times, Out of 21 babies with severe asphyxia, 4 babies (19%) expired<sup>15</sup>. This clearly shows that mortality is more in babies with lower APGAR scores (severe asphyxia). Banget et al also revealed similar findings with mortality rate 3.7% for moderate asphyxia and 38.5% for severe asphyxia<sup>16</sup>. It was concluded by Mary et al, that the 5-minute APGAR score remained a valid predictor of neonatal mortality<sup>17</sup>.

### Conclusion

Perinatal asphyxia causes significant morbidity and mortality in newborn. Five minute APGAR score is an important predictor of perinatal asphyxia. The likelihood for HIE, and its severity are inversely proportional to APGAR score at 5 minutes. Mortality and the occurrence of seizures are directly proportional to the severity of perinatal asphyxia Mortality is 15 times more in severely asphyxiated group when compared to moderately asphyxiated group. Severe HIE is a significant contributor to early neonatal mortality.. Prompt resuscitation and proper follow up care of babies with low APGAR score has positive impact in the immediate outcome of these babies.

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